

# Trek Model 20/20C

## High-Voltage Power Amplifier



The Model 20/20C is a DC-stable, high-voltage power amplifier used in industrial and research applications. It features an all-solid-state design for high slew rate, wide bandwidth and low-noise operation. The four-quadrant, active output stage sinks or sources current into reactive or resistive loads throughout the output voltage range. This type of output is essential to achieve an accurate output response and high slew rate demanded by a variety of loads such as highly capacitive or reactive loads. It is configured as a non-inverting amplifier.

### Key Specifications

- Output Voltage Range: 0 to  $\pm 20$  kV DC or peak AC
- Output Current Range: 0 to  $\pm 20$  mA DC or peak AC
- Slew Rate: Greater than 450 V/ $\mu$ s
- Large Signal Bandwidth (-3 dB): DC to greater than 7.5 kHz
- DC Voltage Gain: Fixed at 2000 V/V

### Typical Applications Include

- Electrostatic deflection
- Electrophoresis
- Electrorheological fluids
- Electro-optic modulation
- Material poling
- AC or DC biasing
- Ion beam steering
- Particle accelerators
- Mass spectrometers
- Material characterization
- Ferroelectrics
- Atmospheric plasma
- Dielectric barrier discharge

### Features and Benefits

- Four-quadrant output for driving capacitive loads
- Closed loop system for high accuracy
- Short-circuit protected for equipment protection
- CE compliant for assured reliability
- All solid-state design for maintenance free operation
- DC-stable for programmable supply applications
- Low output noise for ultra-accurate outputs



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## Model 20/20C Specifications

### Performance

Output Voltage Range	0 to $\pm 20$ kV DC or peak AC
Output Current Range	0 to $\pm 20$ mA DC or peak AC
Input Voltage Range	0 to $\pm 10$ V DC or peak AC
Input Impedance	25 k $\Omega$ , nominal
DC Voltage Gain	2000 V/V
DC Voltage Gain Accuracy	Better than 0.1% of full scale
DC Offset Voltage	Less than $\pm 2$ V
Output Noise	Less than 1.5 V rms*
Slew Rate (10% to 90%, typical)	Greater than 450 V/ $\mu$ s
Large Signal Bandwidth (-3 dB)	DC to greater than 7.5 kHz
Large Signal Bandwidth (1% distortion)	DC to greater than 3.75 kHz
Small Signal Bandwidth (-3dB)	DC to greater than 20 kHz
Stability	
<i>Drift with Time</i>	Less than 50 ppm/hr, noncumulative
<i>Drift with Temp</i>	Less than 100 ppm/ $^{\circ}$ C

### Voltage Monitor

Ratio	1/2000th of the high-voltage output
DC Accuracy	Better than 0.1% of full scale
DC Offset Voltage	Less than $\pm 2$ mV
Output Noise	Less than 10 mV rms*
Output Impedance	47 $\Omega$

### Current Monitor

Ratio	0.5 V/ mA
DC Accuracy	Better than 1% of full scale
Offset Voltage	Less than $\pm 10$ mV
Output Noise	Less than 30 mV rms*
Bandwidth (-3dB)	DC to greater than 10 kHz
Output Impedance	47 $\Omega$

### Features

High-Voltage On/Off	
<i>Local</i>	Individual push-button switch
<i>Remote (TTL compatible input)</i>	TTL high (or open) turns off high-voltage output. TTL low turns on high-voltage output.

### Features (cont.)

Dynamic Adjustment	Graduated 1-turn panel potentiometer is used to optimize the AC response for various load parameters
Current Limit/Trip	Switch selectable for either limit or trip. Graduated 1-turn panel potentiometer is used to adjust limit or trip level from 0 to $\pm 20$ mA
Out of Regulation Status	Illuminates and a TTL low is provided when unit fails to produce required HV output such as during current limit or short circuit load conditions
Trip Status	Illuminates and a TTL low is provided when the high-voltage output is disabled due to the output current exceeding the current trip level, the detection of a high-voltage supply fault or the removal of the top cover
Fault Status	A BNC provides a TTL low when the Model 20/20C is out of regulation for greater than 500 ms

### Mechanical

Dimensions	279 mm H x 482 mm W 654 mm D (11" H x 19" W x 25.75" D)
Weight	24.9 kg (55 lb)
HV Connector	Caton High Voltage Connector
BNC Connectors	Amplifier Input, Voltage Monitor, Current Monitor, Remote High Voltage ON/OFF, Out of Regulation Status, Fault/Trip Status

### Operating Conditions

Temperature	0 $^{\circ}$ C to 40 $^{\circ}$ C (32 $^{\circ}$ F to 104 $^{\circ}$ F)
Relative Humidity	To 85%, noncondensing
Altitude	To 2000 meters (6561.68 ft.)

### Electrical

Line Voltage	Factory Set for one of two ranges: 104 to 127 V AC or 180 to 250 V AC, either at 48 to 63 Hz
AC Line Receptacle	Standard IEC 320 three-prong AC line connector
Power Consumption	1000 VA, maximum

### Supplied Accessories

Operators' Manual	PN: 23177
HV Output Cable	PN: 43466
Line Cord, Spare Fuses	PN: N5011; selected per geographic destination

### Optional Accessories

19" Rack Mount Kit	Model: 608RA (with EIA hole spacing) Model: 608RAJ (with JIS hole spacing)
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\*Measured using the true rms feature of the HP Model 34401A digital multimeter

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